

Hann James

THE
DESCRIPTION

OF A
Pocket MICROSCOPE,

WITH THE
Apparatus Thereto belonging :

Adapted for viewing both Opake and Transparent
OBJECTS.

And likewise of the Part called

The SOLAR APPARATUS ;

As greatly Improved and Made by

JAMES MANN and JAMES AYSCOUGH,

At the Sign of Sir Isaac Newton and Two Pair of
Golden Spectacles near the West End of St. Paul's,
LONDON.

AS Variety of Objects require different Conveniencies in the Apparatus for viewing them, so it is necessary the Curious should be furnished with Instruments that may make their Observations both pleasant and easy, and applicable for all Objects. We have in this MICROSCOPE so contrived the parts, as unperplexed in the Use, and easy for Carriage, as the Price of the whole can possibly admit of; which is almost one third cheaper, and what we flatter ourselves every impartial Judge must allow to be much more compleat and perfect than any yet made; as for instance, the single MICROSCOPE with its Apparatus, the Parts for viewing opaque Objects, and the Brass Scrole and reflecting Mirror, are all contained in a small Case, which may easily be carried in the Pocket. The Apparatus for using it with the Sun, is so contrived as not only to be very easy for Use, but likewise not so liable to Disorder, as those with the Cat-gut and Pully. It being made with Brass, the Sun can have no Effect on it, either to warp or shrink it; as it must of Consequence do to those with Wood.



T H E
DESCRIPTION, &c.

AB. AB. **R**epresents the Body of the Microscope, made either of Silver, Brass, or Ivory.

CC. A long fine threaded male Screw, that turns into the Body of the MICROSCOPE.

D. A Convex Glass at the End of the said Screw.

* Two Concave Pieces of thin Brass, with Holes of different Diameters in the centre of them to cover the said Glass, and thereby diminish the Aperture, when the greatest Magnifiers are used.

EE. Three thin Plates of Brass within the Body of the MICROSCOPE, one whereof is bent semi-circularly in the middle, so as to form an arch'd Cavity for the Reception of a Tube of Glass.

F. A Piece of Wood or Brass, arch'd in the manner of the said Plate, and fastened thereto.

G. The other End of the Microscope, where a hollow female Screw is adapted to receive the different Magnifiers.

H. A spiral Spring of Steel between the said End G and the Plates of Brass EE, intended to keep the Plates in a due Position, and counteract against the long Screw CC.

I. A small turned Handle for the better holding of the Instrument, to screw on or off at Pleasure.

To this MICROSCOPE belong seven different magnifying Glasses: six of which are set either in Silver, Brass, or Ivory, as in the Figure K, and are marked 1, 2, 3, 4, 5, 6. Observe the lowest Numbers are the greatest Magnifiers.

L. Is the seventh Magnifier, set in the manner of a little Barrel, to be held in the Hand, for the viewing any larger Object.

M. Is a flat Slip of Ivory, called a Slider, with four round Holes through it, wherein to place Objects between two Glasses or Talks.

Eight such Ivory Sliders, and one of Brass, usually go with this Microscope; but whoever pleases to make a large Collection of Objects, may have as many as he desires. The Ivory Sliders sold herewith, are numbered 1, 2, 3, 4, 5, 6, 7, 8, and contain the Objects following.

Begin with the Hole in each Slider next the +.

N^o 1.

N^o 2.

N^o 3.N^o 4.N^o 5.N^o 6.

N^o 7 and 8. are Sliders without Objects for the viewing the Animalcula in Liquids, &c. or to put in Objects occasionally.

The Brass Slider is to confine any living Object, that it may be viewed, without crushing or destroying it.

N. Is a Forceps or Pair of Plyers, for the taking up of Insects or other Objects, and adjusting them in the Glasses.

O.



O. A little hair Brush or Pencil, wherewith to put upon the Talks or Ifinglafs any small Drop of Liquid one would examine.

When you design to view an Object, thrust the Ivory Slider (in which the said Object is placed) between the two flat Brass Plates EE; observing always to put that Side of the Slider where the Brass Rings are, farthest from your Eye; then screw in the Magnifying Glass you intend to use at the end of the Instrument G, and looking through it against the Light, turn the long Screw CC, till your Object is brought to the true focal Distance; which you will know by its then appearing perfectly clear and distinct. The way of examining any Object accurately, is, to look at it first through a Magnifier that will shew the whole thereof at once, and afterwards to inspect the several Parts more particularly with one of the greatest Magnifiers: for thus you will gain a true Idea of the whole, and of all its parts; and tho' the greatest Magnifiers can shew but an exceeding minute Portion of any Object at once, such as the Claw of a Flea, the Horn of a Louse, or the like; yet by gently moving the Slider that contains your Object, the Eye will gradually behold it all; and if any Part should be out of Distance, the Screw CC will easily adjust it to its true Focus.

You may change the Objects in your Sliders for what others you think proper, by taking out the Brass Rings with the Point of a Penknife: the Talks will then fall out if you turn the Slider, and after putting what you please between, by replacing the Brass Rings, you will fasten them as before.

The Sliders that are furnished with Talks, but have no Objects, are intended to be alway in readiness for the

the Examination of Fluids, Salts, Powders, or any other casual Objects ; the Circulation of the Blood, or Peristaltick Motion in a Loufe, Flea, Mite in Cheese, or such like Creatures, are best discovered when fixed in, and gently squeezed between the Talks.

P. Is a Tube of Glass, contrived to confine larger Objects, such as a Frog, Fish, or Water-newt, to discover the Circulation of the Blood. If your Object be a Fish, Place it within the Tube, and spread its Tail or Fin against the side thereof; If a Frog chuse such a one as can but just be put into your Glass Tube; and with a Pen or Stick, expand the transparent Membrane between the Toes of the Frog's hind Foot as wide as you can. When your Object is so adjusted, that no Part of it can intercept the Light from the Place you intend to view, unscrew the long Screw CC and thrust your Tube into the arch'd Cavity, quite through the Body of the Microscope; then screw it to the true focal Distance and you will see the Blood passing along its Vessels with a rapid Motion.

Make use of the third or fourth Magnifier for Frogs or Fishes; but for the Tail of Water-newts the fifth or sixth will do, because the Globules of their Blood are larger than those of Frogs or Fishes. The first or second Magnifier cannot well be employed to this purpose; for the Thickness of the Tube wherein the Object lies, will scarce admit its being brought so near as the focal Distance of the Magnifier.

The best Light for viewing Objects is a clear sky-light, the Sun shining on any white thing, or the Reflection of its Rays from a Looking-Glass; which last is found to be full as strong as any, and much more convenient for use, particularly in examining Liquids, for if you hold your Microscope up to receive the Light
from

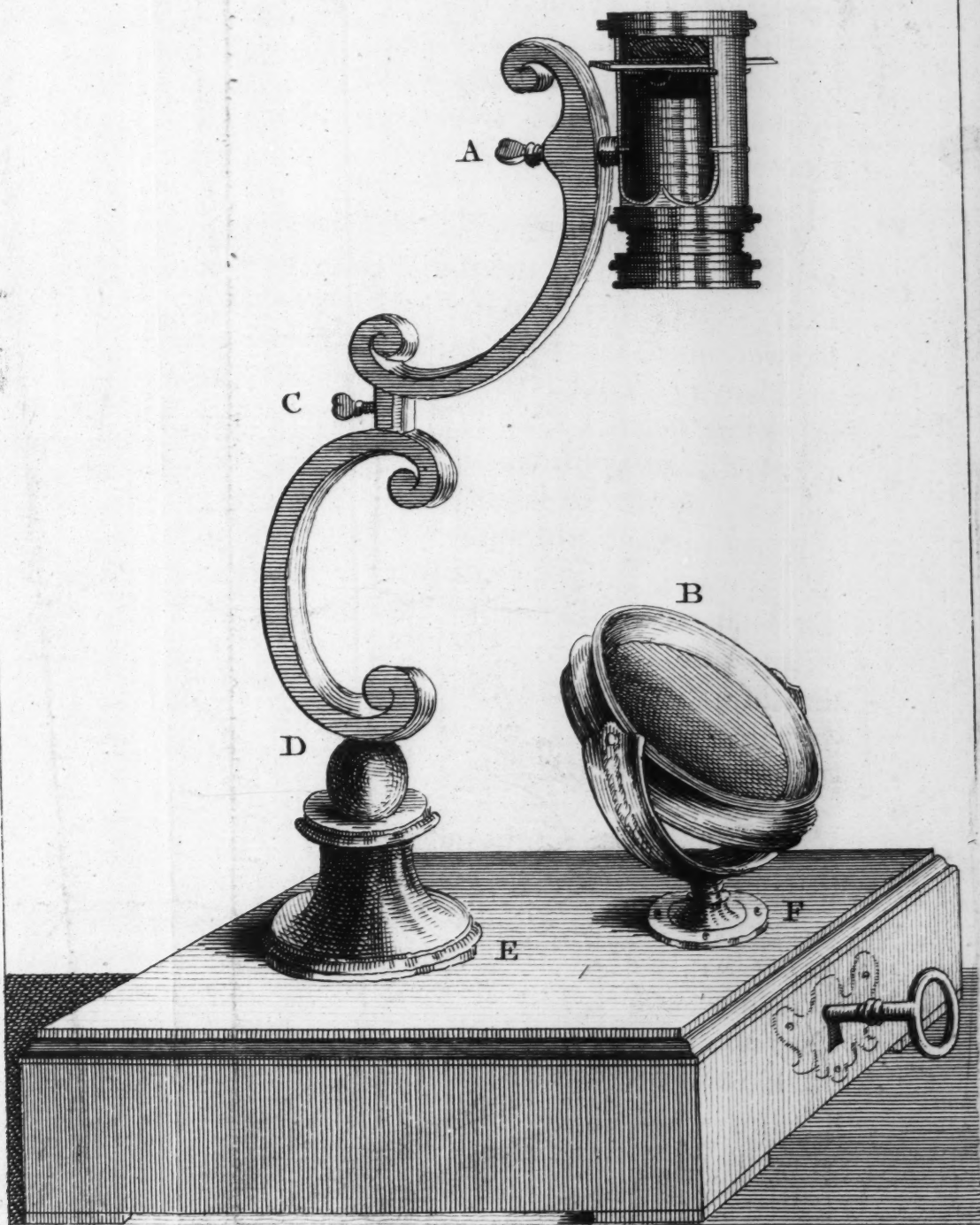
from the Sky, your Liquid subsides, and you soon lose it, but when placed in a perpendicular Position, so as the Rays of the Sun may be thrown from a Glass fixed beneath it, you view it with more Ease and less Inconvenience.

For the Application of which, fix the Body of your Microscope to the top of the Brass Scrole, as in Plate 2. which is done by the Brass Screw, A, being screwed into the same Hole as the Ivory Handle, I, in Plate 1.---Your Ivory or Brass Slider being fixed as before described, and your Microscope being in a perpendicular Position, move the Reflecting Mirror, B till you throw the Light of the Sky, Sun, or Candle, directly upwards through the Microscope, and by so doing it may be made to answer all the Ends of a double Reflecting Microscope (excepting the Field not being quite so large.) The Microscope may also be fixed horizontally, and Objects viewed in that Position by any Light you chuse; which is an Advantage the large Reflecting Microscope has not.

For the better Conveniency of Carriage, this Scrole is contrived to take into three Parts, and put into the Draw it stands on with the reflecting Mirror and all the other Apparatus. The top part is taken off by unscrewing half a turn of the button C, then lift it up and it comes out of a socket. The lower part unscrews at D, and the Base unscrews at E.

The Mirror either lifts out or unscrews at F, which with the Scrole lies in the first Partition of the Box next the Lock.

As all Objects which are of dark opaque Bodies, require the Light to be thrown in a different Position from that of transparent ones, there is annexed to this Microscope three magnifying Glasses, whose focal Distances

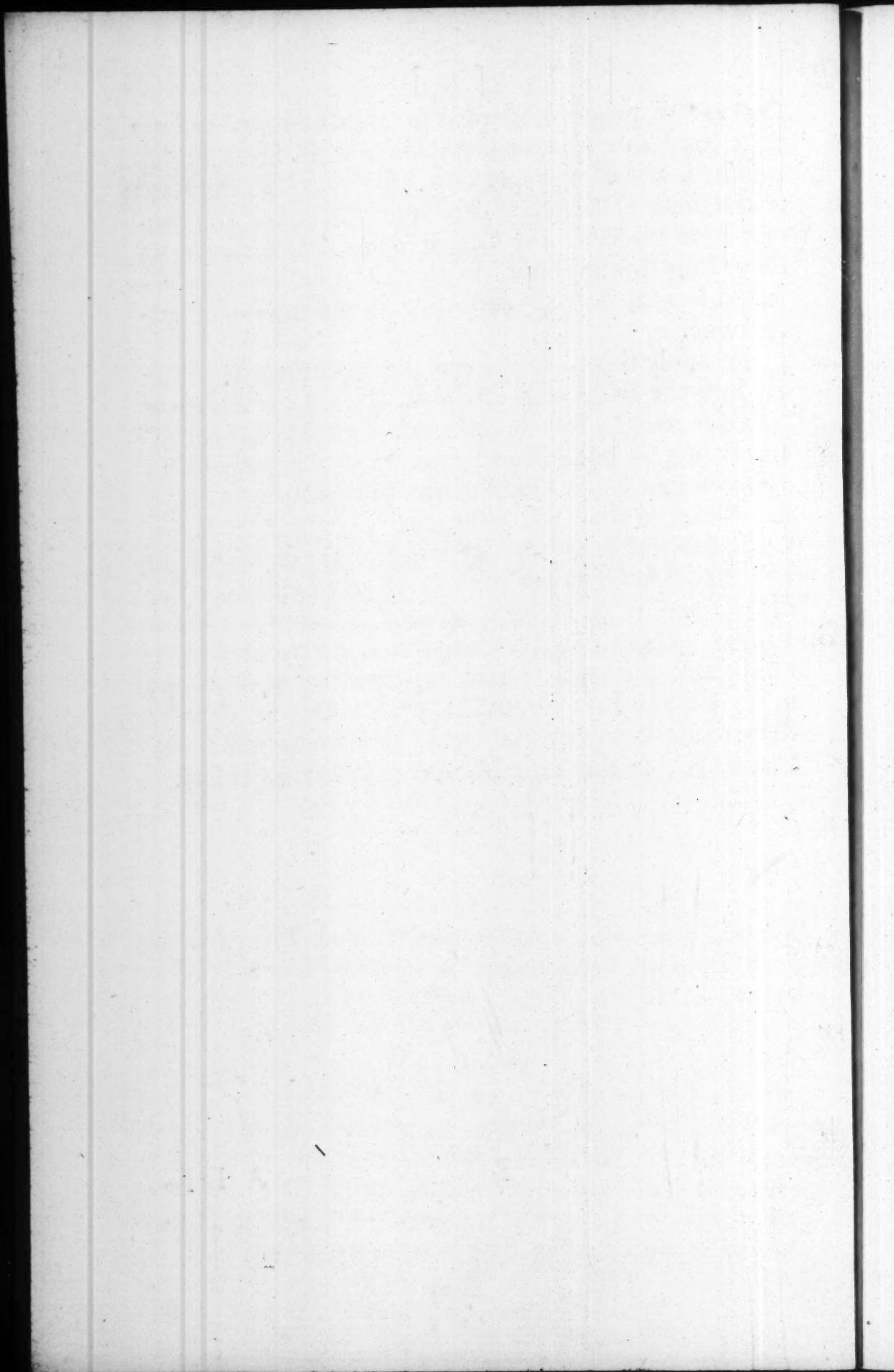


stances are properly adapted for such Objects, and are each fixed in a Cell or Cup, lined with Silver highly polished, and of a proper Concavity to collect the Rays at the same Distance, as the focal Distance of the convex Lens placed in the Centre of it ; which throws an exceeding strong Light, so that the most opaque Object is seen as distinct and clear as the most transparent one.

To apply this to Use, screw the Brass Arm R (Plate 1.) into the Body of the Microscope at G, then screw into the round Hole S either of your Magnifiers, T (according as your Object requires to be magnified) you will find in the Body of the Microscope, between the Wood or Brass, F, and the End of the male Screw CC, a small Hole U, through which slide the long Wire W, which has a Point at one End and Forceps at the other, and is used occasionally as your Object requires. When you have fixed this, and your Object on it, turn the arm, (which is done by two Motions in it) till you have your Glass even with your Object, then adjust it to its true focus, by turning the male Screw CC, in the same Manner as described before.

B

A DE-



A
DESCRIPTION
OF THE
SOLAR, OR CAMERA-OBSCURA
MICROSCOPE,

As Made and Sold by

JAMES MANN,
AND
JAMES AYSCOUGH,

At the Sign of Sir Isaac Newton and Two Pair of
Golden Spectacles near the West End of St. Paul's,
LONDON.

WHEN the Microscope is made Use of in this new Way; that is, by directing the Sun's Rays through a Tube, upon some Object placed within and near the End of the said Tube, the Image or Picture of the Object is thrown in a most exact, beautiful, and surprizing Manner, upon a white Screen or linnen Sheet, placed on Purpose to receive the same: and thus all microscopical Objects, that are transparent, may be examined with a great deal of Ease and Pleasure, since hereby, they become exceedingly magnified beyond what they have ever been by any other Con-

trivance ; and with these farther Advantages, that several People may view them at the same Time ; that the weakest Eyes are in no Danger of being fatigued or strained ; and that even such as have no Skill in Drawing, may easily trace out the Figure of any Object with a Pen or Pencil, as it lies before them.

The Microscope employed for this Service, is that already described in Plate 1. The other Parts of the Apparatus are represented in Plate 3, and are as follows.

A B. A B. A circular Frame of Brass, which by the Assistance of the two Nuts CC, and the two Screws DD, is fastened firmly to the Window-shutter, a Hole being first made to let that of the Brass Circle BB easily through, and the two Nuts CC being fixt in the Shutter by four little Iron Screws, the Looking-glass EE, which is fixed to the circular Piece of Mahogany by means of a Brass Wire going through the Joint, which is taken in and out at Pleasure. At the Bottom of the Looking-glass is a Brass Nut or Joint with a hollow Screw, that receives the Iron male Screw, which goes through the Mahogany ; this must be first screwed in before the Brass Pin is put through the Joint. This being done, and the Brass Circle fastened to the Shutter, with the Looking-glass on the Outside, screw the Tube FF covered with Black into the Brass Collar, provided for it in the circular Piece of Mahogany : the Lens on the Outside being about twelve Inches Focus, and a proper Distance for Things that have no Life, is commonly at about ten or eleven Inches ; but it must be shortened for living Objects, till they can well sustain the Heat ; therefore pull out the Brass Draw G to one of the Marks made thereon, as you find most necessary.

Then

Then adjust your Looking-glass to the Altitude and Situation of the Sun. The Brass Knob or Button H is the Head of a Screw which goes through the Mahogany Piece, and has a Communication with the Looking-glass, which by screwing and unscrewing, elevates and depresses the Glass, and at the same Time is a Handle to move round the circular Piece of Mahogany, to which the Glass is likewise fixt, and by which two Motions you throw the Sun's Rays in a direct Line through the Tube, and form a round Spot of Light on your Screen or Sheet. When this Spot is exactly round, your Glasses are then in a right Position.

Things being thus prepared, screw the short Tube I, fast to the Body of your Microscope, at that End of the male Screw C C, where the convex Lens D is placed (first taking the Glass out) your Slider being fixed between the Brass Plates as usual, and properly adjusted to the magnifying Lens, slide the Tube I, over the small End K of the Tube F. If the Light falls not exactly right, when the Microscope is applied to the Tube K, by a gentle Turn of the Button H you may easily direct the Sun's Rays through the Axis of the microscopic Lens.

Observation must be made that as the Sun is in continual Motion, it will be required often to have the Looking-glass moved likewise; which by a little Practice is easily done to the greatest Nicety; for the Distinctness of your Object depends greatly on the Sun's Rays being thrown exactly through the small Lens.

Though obtaining a perfectly circular Spot of Light upon the Screen, before you apply the Microscope, is a certain Proof that your Lookin-
Glass

Glass is adjusted right; that Proof must not be always expected; for the Sun is so low in Winter that (if it shines in a direct Line against the Window) it cannot then afford a Spot of Light quite round; however if the Day be clear, the Sun bright, and its Situation on one Side of you, it will shew Objects very agreeable even in December.

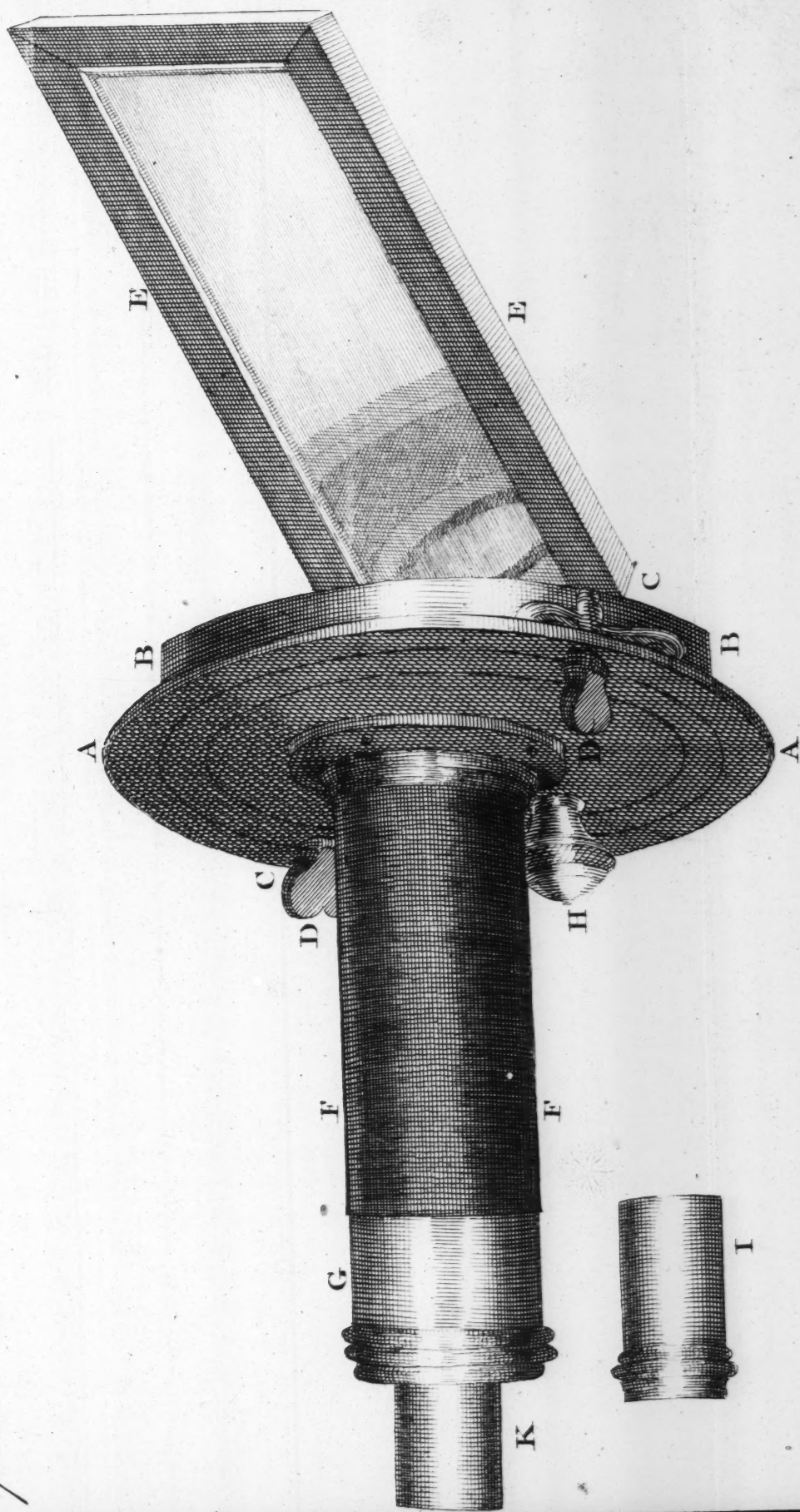
The properest Magnifiers for the Solar Microscope are in general, the Fourth, Fifth, and Sixth.

As Mention has been made of a Screen to throw the Image of the Object on; it is proper to take notice, that there are two Sorts of Screens, of different Sizes, useful for this Purpose, the smaller Sort, is made of a Single Sheet of Elephant Paper strained in a Frame, which slides up or down on a round Pillar of Mahogany and may be moved farther or nearer at Pleasure. The larger contains several Sheets of the same Paper pasted together lined with Cloth, and let down with a Roller in the manner of a large Map.

The Advantages of this Microscope beyond all others, are obvious at first Sight, since Objects may by it be magnified to what Size you please; only by removing the Screen to a farther Distance from them: However seeing them distinctly is the chief thing to be regarded, and moving the Screen a little backwards and forwards, will shew where that can be best done. A Louse may be magnified to five or six Feet, and be seen distinctly.

12 JY 64

F I N I S.



J A M E S M A N N
 A N D
 J A M E S A Y S C O U G H,
 O P T I C I A N S,

At the Sign of Sir ISAAC NEWTON, and Two Pair
 of Golden Spectacles near the West-End of St.
 Paul's, L O N D O N ;

MAKE, and sell, Wholesale and Retail, the
 finest Chrystal Spectacles, ground upon Brass
 Tools (approved by the ROYAL SOCIETY and
 the greatest Mathematicians) set in Gold, Silver, Tor-
 toiseshell, Horn, Leather and all manner of ways that
 are most convenient and beautiful. Also curious
 Reading Glasses of Rock Chrystal, or the whitest
 Flint, contrived to turn into Cases of various Kinds,
 to be carried in the Pocket without Trouble or Damage.
 Likewise Spectacles of true Venetian Green-Glass.

N. B. Whereas false ground Spectacles are very
 prejudicial to the Eyes; the Curious may here
 be shewn in a minute's time how to distinguish
 between those that are true, and those that are
 false.

They make Concaves for Myops or Short-sighted
 Persons, which are so nicely adapted to every degree
 of Short sightedness, and by so regular a Method,
 that Persons after being once fitted, may at all times
 be furnished with them (though at ever so great a di-
 stance) as exact as if present.

REFLECT-

REFLECTING TELESCOPES on the Principles of Sir ISAAC NEWTON, and Mr. GREGORY, made with the greatest accuracy, and the Apparatus finished and adapted in so compleat a manner, as renders the use of them pleasant and easy. Also **MICROSCOPES** double and single (with all the Modern Improvements,) which magnify to so great a degree, that the Circulation of the Blood in Animals, the Animalcula in Fluids, and the Farina of Vegetables, with many other Phœnomena, otherwise imperceptible, are clearly discovered.—Particularly an Improvement of the Apparatus of the solar Microscope, which renders it much easier for use, and less liable to disorder, than any yet extant.

PRISMS for demonstrating the surprizing Theory of Light and Colours; Camera Obscura's for delineating views in Perspective, Convex, and Concave; Speculums of all Sizes; Magick Lanthorns, Opera Glasses, Multiplying and Magnifying Glasses, Barometers, Thermometers; with many other Curiosities not here mentioned.

REFRACTING TELESCOPES IMPROVED, By a new method of figuring the Glasses, which are allowed by the best Judges (who have made the Comparifon) to excell any yet made in *England*, and equal in all respects to those of the celebrated PETRO PATRONE at *Milan*; by which Improvement, those of two, three, and four Feet, are rendered much more useful at Sea, than any have hitherto been, and are made ONLY by the abovesaid Operators.

12 JY 64

